CLAIMS

We claim:

Sub C1

1. An organic field effect transistor (FET) comprising an active dielectric layer disposed on a substrate, the substrate being suitable for an organic FET, wherein the active dielectric layer comprises a low-temperature cured film of at least one liquid-deposited silsesquioxane precursor to provide a high-dielectric strength film.

2. The organic FET of claim 1 in which the silsesquioxane precursor is selected from oligomers having alkyl(methyl) and alkyl(methyl) phenyl pendant groups.

Sub C2

3. The organic FET of claim 1 in which the low-temperature cured film comprises a film cured at temperatures of less than 150°C.

4. The organic FET of claim 1 in which the high-dielectric strength film has a dielectric constant of greater than 2.

5. The organic FET of claim 1 in which the substrate comprises an indium-tin oxide coated plastic substrate.

6. The organic FET device of claim 1 in which the substrate comprises a plasma-etched substrate.

7. The organic FET device of claim 1 in which the active dielectric layer comprises a silane-reagent treated layer.

8. The organic FET device of claim 7, in which the silane reagents are selected from the group $X\text{-}Si(OR^1)_m(R^2)_n$, where the values for m and n are from 0 to 3 and m+n=3; R^1 is an alkyl group having from 1 to 6 carbon atoms; R^2 is an alkyl group having from 1 to 16 carbon atoms or a halogen group; and X is a substituent selected from a substituted or unsubstituted aryl, $F_3C(F_2C)_9CH_2$-, the group $NH(Si)(CH_3)_3$; and a saturated or unsaturated alkyl or alkoxycarbonyl having from 6 to 20 carbon atoms.

9. The organic FET of claim 8, in which the silane reagents are selected from $F_3C(F_2C)_9CH_2\text{-}Si(OCH_3)_3$; $C_8H_{17}Si(OCH_3)(CH_3)_2$; $C_6H_5Si(OCH_3)_3$; $C_{18}H_{37}Si(OCH_3)_3$; $CH_2CH\text{-}C(O)\text{-}O\text{-}(CH_2)_3Si(OCH_3)(CH_3)_2$; $F_3C(F_2C)_9\text{-}Si(Cl)_3$; $Cl\text{-}CH_4SiCl_2CH_3$; and $(CH_3)_3SiNHSi(CH_3)_3$.

10. An organic field effect transistor (FET) comprising an active dielectric layer disposed on a substrate, the substrate being suitable for an organic (FET), wherein the active dielectric layer comprises a low-temperature cured high-speed

deposition product of at least one of liquid-deposited alkyl(methyl) and alkyl(methyl) phenyl silsesquioxane precursors, and has a dielectric constant of above about 2.

11. The organic FET of claim 10 in which the high-speed deposition comprises deposition at speeds of about 1,000 rpm or greater.

12. The organic FET of claim 10 in which the low-temperature cured product comprises a product cured at temperatures of less than 200°C.

13. A process for making an organic FET comprising:

providing a substrate suitable for an organic FET;

applying a liquid-phase solution including at least one silsesquioxane precursor over the surface of the substrate; and

curing the solution to form a high-dielectric constant film of silsesquioxanes.

14. The process of claim 13 in which the step of curing comprises heating the substrate and solution to a temperature of less than 150°C.

15. The process of claim 13, further comprising a step of cleaning the substrate before the solution of silsesquioxane precursors is applied.

16. The process of claim 13, in which the step of cleaning is achieved by rinsing with acetone, methanol, or de-ionized water.

17. The process of claim 13, in which the step of cleaning is achieved by reactive ion etching a surface of the substrate with oxygen plasma.

18. The process of claim 13, in which the step of applying the liquid-phase solution comprises spin-casting.

19. An article comprising an organic FET comprising:

a gate electrode on a substrate;

a layer of insulating material over the substrate;

an active semiconducting layer over the insulating layer, wherein the active dielectric layer comprises a low-temperature cured high-speed deposition product of at least silsesquioxane precursor; and

a source electrode and a drain electrode in contact with the active semiconducting layer.